IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of
Inventor(s): IHATA et al

Appln. No. 10/620,443 Group Art: 2834

Filed: 07/17/2003 Examiner: DAVID W. SCHEUERMANN

Title: AUTOMOTIVE ALTERNATOR HAVING RECTIFIER MOUNTED ON HEATSINK PLATE WITH COOLING FINS

VERIFIED TRANSLATION OF PRIORITY DOCUMENT

The undersigned, of the below address, hereby certifies that he/she well knows both the English and Japanese languages, and that the attached is an accurate translation into the English language of the Certified Copy, filed for this application under 35 U.S.C. Section 119 and/or 365, of:

Application No.	Country	Date Filed
2002-253770	Japan	August 30, 2002

Signed this 16th day of December, 2005.

Signature: R. Tanaka

Name: Ryoko TANAKA

Address: c/o Intertec Corporation
Toranomon Akiyama Building
1-22-13, Toranomon, Minato-ku
Tokyo, 105-0001, JAPAN

[Name of Document] Patent Application
[Reference Number] PN065790
[Filing Date] August 30, 2002
[Address] Commissioner, Patent Office
[International Patent Classification] H02K 9/06
[Inventor]
[Address] c/o DENSO CORPORATION
1-1 Showa-cho, Kariya-city, Aichi-pref.
[Name] Shigenobu NAKAMURA
[Inventor]
[Address] c/o DENSO CORPORATION
1-1 Showa-cho, Kariya-city, Aichi-pref.
[Name] Kouichi IHATA
[Inventor]
[Address] c/o DENSO CORPORATION
1-1 Showa-cho, Kariya-city, Aichi-pref.
[Name] Motoki ITO
[Applicant]
[Identification Number] 000004260
[Name] DENSO CORPORATION
[Agent]
[Identification Number] 100096998
[Patent Attorney]
[Name] Hirohiko USUI
[Phone Number] 0566-25-5988
[Assigned Agent]
[Identification Number] 100118197
[Patent Attorney]
[Name] Daito KATO
[Phone Number] 0566-25-5987
[Indication of Fees]
[Prepayment Book Number] 010331
[Amount of Payment] ¥21,000
[List of Submitted Articles]
[Name of Article] Specification 1
[Name of Article] Drawings 1
[Name of Article] Abstract 1
[General Power of Attorney Number] 9912770
[General Power of Attorney Number] 0103466
[Need of Proof] Needed

[Name of Document] Specification

[Title of the Invention] AC Generator for Vehicle

[Claims]

1. An AC generator for a vehicle, comprising a rotor, a stator disposed in opposition to the rotor, a frame for supporting both the rotor and the stator, a rectifying device fixed to an outer end face of the frame, a protective cover fixed to the frame so as to cover the rectifying device, and a cooling fan fixed to the rotor to introduce cooling air from the exterior to the interior through the rectifying device and further through a frame intake port, characterized in that:

the rectifying device comprises a negative fin extended substantially radially while confronting the outer end face of the frame and constituting a combined negative rectifying element cooling member and rectifying element connecting conductor, a positive fin constituting a combined positive rectifying element cooling member and rectifying element connecting conductor while confronting an inner end face of the protective cover, and a plurality of rectifying elements fixed to both the fins;

a lead terminal of the negative rectifying element is disposed so as to face the protective cover located at an axially rear position;

a gap for radially introducing the outside air is formed between the negative fin and the frame opposed thereto;

the protective cover has a plurality of axial apertures and radial apertures; and

the negative fin located at a position corresponding to the radial apertures has sub fins extending in the same axial direction as the lead terminal.

2. An AC generator for a vehicle according to claim 1,

wherein the sub fins are arranged so as to form a plurality of radial air flow paths relative to a rotational center of the rotor.

3. An AC generator for a vehicle according to claim 1 or claim 2,

wherein axial endmost portions of the sub fins lie in axial positions equal to or longer than axial rear ends of the radial apertures of the protective cover.

4. An AC generator for a vehicle according to any of claims 1 to 3,

wherein an outer end face of the negative fin has a diameter larger than that of an outer end face of the positive fin, a radial section of each of the sub fins is in a generally polygonal shape one side of which is a base portion, and axial endmost portions of the sub fins are disposed more on the large diameter side than an outer end face of the positive fin.

5. An AC generator for a vehicle according to any of claims 1 to 4,

wherein a plurality of grooves connecting the frame intake port and an outer periphery portion of the frame are formed radially in the surface of the frame confronting the negative fin, the grooves extending at least across an end face of the negative rectifying element.

6. An AC generator for a vehicle according to claim 5, wherein the confronting surface portions of the frame and the negative fin other than the grooves are in contact with each other or heat-conductive grease is filled in between the two.

7. An AC generator for a vehicle comprising a rotor, a stator disposed in opposition to the rotor, a frame for supporting both the rotor and the stator, a rectifying device fixed to an inner end face of the frame, a partition plate fixed to the frame to partition the rectifying device axially from the rotor, and a cooling fan fixed to the rotor to introduce cooling air from the exterior through the rectifying device and further through an air flow port formed in the partition plate, characterized in that:

the rectifying device comprises a large-diameter fin extended substantially radially while confronting the partition plate and constituting a combined rectifying element cooling member and rectifying element connecting conductor, a small-diameter fin constituting a combined rectifying element cooling member and rectifying element connecting conductor while confronting the inner end face of the frame, and a plurality of rectifying elements fixed to both the fins;

the frame has a plurality of axial apertures and radial apertures; and

the large-diameter fin located at a position corresponding to the radial apertures has sub fins extending axially toward the inner end face of the frame.

8. An AC generator for a vehicle according to claim 7,

wherein the sub fins are arranged so as to form a plurality of radial air paths relative to a rotational center of the rotor.

9. An AC generator for a vehicle according to claim 7 or claim 8,

wherein axial endmost portions of the sub fins are positioned on a larger-diameter side with respect to an outer end face of the small-diameter fin.

10. An AC generator for a vehicle according to any of claims 7 to 9,

wherein a radial air flow path connecting the radial apertures of the frame and the air flow port of the partition plate is formed between the partition plate and the large-diameter fin.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to an AC generator for being mounted on a vehicle, for example, on a passenger car or a truck.

[0002]

[Prior Art and Problems to be Solved by the Invention]

The engine room has recently been becoming more and more narrow in reply to such needs as attaining a slant nose for the reduction of vehicle running resistance and ensuring a sufficient interior space. Consequently, the space for mounting an AC generator for a vehicle is also becoming narrower and the internal temperature of the engine room also tends to become higher. Besides, for the improvement of fuel economy,

the engine speed lowers for example during idling and so does the number of revolutions of the vehicular AC generator. This notwithstanding, there exists a demand for improvement of the power generating capacity due to an increase of an electric load in safety control devices. To meet this demand, the generation of heat from various parts which constitute the generator increases. Particularly, a rise in temperature of a rectifying element (diode) in a rectifying device for converting AC voltage generated by a stator into DC voltage comes into question. That is, it is necessary that the cooling fin used be cooled in a more satisfactory manner within a limited space.

[0003]

Moreover, with the tendency to a slant nose, the possibility of water or foreign matter splashed from tires may come flying to the vehicular AC generator has become stronger. Particularly, in a cold district, salty water as an electrolyte formed by thawed salt comes flying to the vehicular AC generator, thus giving rise to the problem that electric parts are corroded. The same problem also arises in car shampooing in the engine room because the car shampoo is an electrolyte.

[0004]

On the other hand, in JP-11-164538A there is disclosed a construction wherein, in an axial two-stage cooling fin of a rectifying device, in order to improve the cooling performance of a negative fin located at a position distant from an ordinary cooling air intake port of a protective cover, a radial aperture is formed between a frame and the negative fin, allowing cooling

air to be admitted from the exterior directly through the radial aperture, thereby improving the cooling performance of the negative fin.

[0005]

Further, in JP-2001-169510A is disclosed a construction wherein a radially spreading fin and a through hole are formed axially of a rectifying device to improve the cooling performance.

[0006]

However, with the recent improvement in efficiency of devices mounted on vehicles, new heaters taking shortage of heat sources into account and exhaust gas purifying devices have been developed, resulting in that a still higher output is being required. With only the cooling structure disclosed in JP-11-164538A, it has become insufficient. A conceivable measure is to increase the size of the cooling fin, thereby increasing the heat dissipating area, or increase the size of the fan, thereby increasing the amount of cooling air. However, these measures are contrary to the reduction in size of the generator. Besides, JP-11-164538A gives no consideration about the improvement of resistance to environmental conditions such as resistance to the situation that an electrolyte comes flying.

[0007]

In JP-2001-169510A, there are provided a two-stage cooling fin and an axial fin and also at a radially overlapping position of both fins there is provided an axial fin, thus

resulting in an increase in axial size of the rectifying device, which is contrary to the reduction in size of the generator. Besides, no description is found therein about a protective cover for the rectifying device, nor is given any consideration about the improvement of resistance to environmental conditions such as resistance to the situation that an electrolyte comes flying.

[0008]

In view of the above-mentioned problems it is an object of the present invention to provide an AC generator for a vehicle including a rectifying device able to attain both improvement of cooling performance capable of being exhibited to a satisfactory extent under a reduced size and a high output and improvement of resistance to environmental conditions.

[0009]

[Means for Solving the Problems]

For achieving the above-mentioned object, according to claim 1, there is provided an AC generator for a vehicle comprising a rotor, a stator disposed in opposition to the rotor, a frame for supporting both the rotor and the stator, a rectifying device fixed to an outer end face of the frame, a protective cover fixed to the frame so as to cover the rectifying device, and a cooling fin fixed to the rotor to introduce cooling air from the exterior to the interior through the rectifying device and further through a frame intake port, characterized in that the rectifying device comprises a negative fin extended substantially radially while confronting the outer end face of

the frame and constituting a combined negative rectifying element cooling member and rectifying element connecting conductor, a positive fin constituting a combined positive rectifying element cooling member and rectifying element connecting conductor while confronting an inner end face of the protective cover, and a plurality of rectifying elements fixed to both the fins, a lead terminal of the negative rectifying element is disposed so as to face the protective cover located at an axially rear position, a gap for radially introducing the outside air being formed between the negative fin and the frame opposed thereto, the protective cover has a plurality of axial apertures and radial apertures, and the negative fin located at a position corresponding to the radial apertures has sub fins extending in the same axial direction as the lead terminal. According to this construction, since radial air flow paths from the exterior are formed on both axial faces of the negative fin, and sub fins are arranged along the radial air flow paths, it is possible to improve the cooling performance. Besides, since apertures are formed in the radial direction of the protective cover, even if an electrolyte comes flying, it becomes easier for the electrolyte to flow out through the apertures without staying in the interior by virtue of gravity and thus it is possible to improve the resistance to environmental conditions.

[0010]

According to claim 2 there is provided, in combination with claim 1, an AC generator for a vehicle wherein the sub fins are arranged so as to form a plurality of radial air flow paths

relative to a rotational center of the rotor. According to this construction, it is not only possible to reduce the air flow resistance of cooling air introduced radially by the fan of the rotor and thereby increase the amount of cooling air flowing between the sub fins, but also possible to increase the air-striking surface area of the sub fins and thereby improve the cooling performance for the rectifying device.

[0011]

According to claim 3 there is provided, in combination with claim 1 or claim 2, an AC generator for a vehicle wherein axial endmost portions of the sub fins lie in axial positions equal to or longer than axial rear ends of the radial apertures of the protective cover. According to this construction, it is possible to prevent the entry of foreign matter from the exterior in the radial direction and ensure cooling air flow paths.

[0012]

According to claim 4 there is provided, in combination with any of claims 1 to 3, an AC generator for a vehicle wherein an outer end face of the negative fin has a diameter larger than that of an outer end face of the positive fin, a radial section of each of the sub fins is in a generally polygonal shape one side of which is a base portion, and axial endmost portions of the sub fins are disposed more on the large diameter side than an outer end face of the positive fin. According to this construction it is possible to ensure an appropriate distance from the positive fin and improve the resistance to

environmental conditions while preventing the entry of foreign matter from the exterior in the radial direction and improving the strength of the sub fins. Further, since the sub fins are provided on only the negative fin and there are no axial endmost portions of the sub fins at the radially overlapping position of both negative and positive fins, it is possible to ensure the reduction in size of the generator without increasing the axial size of the rectifying device.

[0013]

According to claim 5 there is provided, in combination with any of claims 1 to 4, an AC generator for a vehicle wherein a plurality of grooves connecting the frame intake port and an outer periphery portion of the frame are formed radially in the surface of the frame confronting the negative fin, the grooves extending at least across an end face of the negative rectifying element. According to this construction, cooling air can be allowed to flow concentratively near the negative rectifying element as a heat generating source, whereby the cooling performance for the rectifying device can be attained.

[0014]

According to claim 6 there is provided, in combination with claim 5, an AC generator for a vehicle wherein the confronting surface portions of the frame and the negative fin other than the grooves are in contact with each other or heat-conductive grease is filled in between the two. According to this construction, since the heat conduction from the negative fin to the frame can be promoted, the cooling

performance for the rectifying device can be further improved.

[0015]

According to claim 7 there is provided an AC generator for a vehicle, comprising a rotor, a stator disposed in opposition to the rotor, a frame for supporting both the rotor and the stator, a rectifying device fixed to an inner end face of the frame, a partition plate fixed to the frame to partition the rectifying device axially from the rotor, and a cooling fan fixed to the rotor to introduce cooling air from the exterior through the rectifying device and further through an air flow port formed in the partition plate, characterized in that the rectifying device comprises a large-diameter fin extended substantially radially while confronting the partition plate and constituting a combined rectifying element cooling member and a rectifying element connecting conductor, a small-diameter fin constituting a combined rectifying element cooling member and rectifying element connecting conductor while confronting the inner end face of the frame, and a plurality of rectifying elements fixed to both the fins, the frame has a plurality of axial apertures and radial apertures, and the large-diameter fin located at a position corresponding to the radial apertures has sub fins extending axially toward the inner end face of the frame. According to this construction the cooling performance can be improved because the cooling air introduced radially from the exterior of a rear frame flows along the sub fins. Besides, since apertures are formed radially of the rear frame, even if an electrolyte comes flying, the electrolyte can flow out easily

through the said apertures without staying in the interior by virtue of gravity, whereby the resistance to environmental conditions can be improved.

[0016]

According to claim 8 there is provided, in combination with claim 7, an AC generator for a vehicle wherein the sub fins are arranged so as to form a plurality of radial air paths relative to a rotational center of the rotor. According to this construction, it is not only possible to decrease the air flow resistance of cooling air introduced radially by the fan of the rotor and thereby increase the amount of cooling air passing between the sub fins, but also possible to increase the air-striking surface area of the sub fins. Consequently, it is possible to improve the cooling performance for the rectifying device.

[0017]

According to claim 9 there is provided, in combination with claim 7 or claim 8, an AC generator for a vehicle wherein axial endmost portions of the sub fins are positioned on a larger-diameter side with respect to an outer end face of the small-diameter fin. According to this construction, the sub fins are provided on only the large-diameter fins and axial endmost portions of the sub fins do not lie in the radially overlapping position of both large- and small-diameter fins, so that the reduction in size of the generator can be ensured without increasing the axial size of the rectifying device.

[0018]

According to claim 10 there is provided, in combination with any of claims 7 to 9, an AC generator for a vehicle wherein a radial air flow path connecting the radial apertures of the frame and the air flow port of the partition plate is formed between the partition plate and the large-diameter fin. According to this construction, the cooling performance can be improved because radial air flow paths from the exterior are formed on both axial faces of the large-diameter fins.

[0019]

[Mode for Carrying Out the Invention]

Preferred embodiments of the present invention will be described below.

[0020]

[First Embodiment]

An AC generator for a vehicle according to a first embodiment of the present invention is shown in Figs. 1 to 6. The AC generator comprises a rotor 2 which is rotated by an engine through a belt (not shown) and a pulley 1, a stator 4 serving as an armature, a front frame 3a and a rear frame 3b which support the rotor 2 and the stator 4 through a pair of bearings 3c and 3d, a rectifying device 5 connected to the stator 4 to convert AC power to DC power, a brush holder 7 for holding a brush to supply a field current to a field coil 2a of the rotor 2, a regulator 9 for controlling an output voltage, a connector case 6 having terminals for input and output of electric signals between it and the vehicle, and a protective cover 9 made of resin which is applied to an end face of the rear frame 3b so

as to cover the rectifying device 5, regulator 9 and brush holder 7.

[0021]

The rectifying device 5 comprises a positive fin 501 and a negative fin 503 which are mutually superimposed axially in two stages, as well as a positive diode 502, a negative diode 504 and a terminal block 513. As shown in Figs. 1 and 3, the terminal block 513 is constituted by a resinous insulating member for electrical insulation between both cooling fins 501 and 503 and incorporates a conductive member for conducting AC voltage developed in the stator 2 to the diodes 502 and 504. The diodes 502 and 504 are arranged so that their lead terminals face respectively toward the fins of different polarities, and are fixed by being driven to the positive fin 501 and the negative fin 503. The lead terminals are electrically connected to the conductive member in the terminal block 513, forming a full-wave rectifier circuit. In this embodiment, as shown in Fig. 2, six diodes are arranged for each fin so as to form two sets of three-phase full-wave rectifier circuit. A DC output is drawn from a bolt 506 attached to the positive fin 501. The rectifying device 5 is disposed between the frame 3b and the protective cover 8 and is fixedly clamped together with the protective cover 8 to a support member 31 of a rear bearing box 30. The negative fin 503 is larger in outside diameter than the positive fin 501 and the negative diode 504 is disposed on a larger-diameter side than the positive diode 502. As the material of the positive fin 501 and negative fin 503 there is

used aluminum or copper.

[0022]

Axial apertures 801 are formed in the protective cover 8 at positions near the positive diode 502. At inner and outer periphery ends of the positive fin 501 are formed ribs 510 and 511 respectively which are bent toward the protective cover 8. Consequently, cooling air introduced into the apertures 801 from the exterior flow concentratively around the positive diode 502 as a source of heat generation and the heat dissipating area of the positive fin 501 increases, whereby it is possible to ensure a cooling performance for the positive diode 502.

[0023]

On the other hand, near the outer periphery of the negative fin 503 there are provided several portions in each of which are provided plural sub fins 505 in proximity to one another, the sub fins 505 extending in a radial fashion in the axial direction on the side opposite to the frame. A radial air flow path 506 is formed radially between adjacent sub fins 505. Radial apertures 804 are formed in the protective cover 8 in radially outer positions corresponding to the plural sub fins 505. Axial endmost portions of the sub fins 505 are located at axial positions equal to or longer than the axial ends of the radial apertures 804 of the protective cover 8 and are located more on the large diameter side than the outer periphery end of the positive fin 501. As shown in Fig. 3, the negative fin 503, around its clamped and fixed portion, is in contact with a rear frame 8b. In the other portion, at least between

the driven portion of the negative diode 504 and the rear frame 8b, there are formed air flow grooves 810 leading to an intake port 803 of the rear frame 8b from radial apertures 802 formed between the protective cover 8 and the rear frame 8b.
The sub fins 505 are formed integrally with the negative fin 503 by die casting or by machining such as driving, welding or post-cutting.

[0024]

When the cooling air introduced from the radial apertures 804 by a fan 21 of the rotor 2 passes through the air flow paths 506 between the sub fins 505 and is conducted to the intake port 803, there occurs an air flow resistance. According to the above construction, this air flow resistance is reduced, so that the heat dissipating area of the negative fin 503 can be increased by an amount corresponding to the surface area of the sub fins 505 while ensuring a required amount of cooling air. It is also possible to let cooling air flow from the radial gaps 802 into the air flow paths 810 formed between the protective cover and the rear frame 8b. Thus, the negative diode 504 and the negative fin 503 can be cooled on both axial faces thereof by the thus-flowing cooling air, so that it is possible to improve the cooling performance. Besides, since the apertures 804 are formed radially of the protective cover 8, even if an electrolyte comes flying, it becomes easier for the electrolyte to flow out from the apertures 804 without staying in the interior by virtue of gravity, whereby it is possible to improve the resistance to environmental conditions. Moreover, with

the sub fins 505, the entry of foreign matter from the radial apertures 804 can be prevented and it is possible to ensure a cooling air flow path. Further, since the axial endmost portions of the sub fins 505 are positioned more on the large diameter side than the outer end face of the positive fin 501, a conventional spacing can be maintained as the spacing between the fins disposed in two stages, that is, it is not necessary to make the axial size of the rectifying device 5 larger than the conventional like size and thus the reduction in size of the generator is not obstructed.

[0025]

[Other Embodiment]

As shown in Fig. 7, the surface of the rear frame 3b opposed to the negative fin 503 may be constituted by a plurality of radial air flow grooves 810 leading to the intake port 803 from the outer periphery portion of the rear frame 3b and convex surfaces 811 each formed between adjacent grooves 810. In this case, an air flow groove 810 is sure to be disposed on the back side of the driven portion of the negative diode 504. The convex surfaces 811 and the negative fin 503 may be kept in metallic contact with each other by screwing for example and a heat transfer promoting material such as heat-conductive grease may be interposed therebetween. As to the depth of the plural radial air flow grooves 810, a groove (810a) extending behind the driven portion of the negative diode 504 may be set shallower than the other grooves. By so doing, the transfer of heat from the negative fin 503 to the rear frame 8b can be promoted while

allowing cooling air to flow positively near the opposite-to-lead terminal end face of the negative diode 504. Further, the portion itself of the rear frame 8b opposed to the negative fin 503 can be made a heat dissipating fin by the plural radial air flow grooves 810. Consequently, the cooling performance can be further improved.

[0026]

As shown in Fig. 8, without using the protective cover 8, the bearing 3d may be disposed at an end portion of the rotor and the rectifying device 5 may be disposed between the rear frame 3b and the partition plate 10. In the rear frame 3b are formed an axial intake window 801a and radial intake windows 802a, 802b. With rotation of the cooling fan 21, cooling air which has been introduced from these intake windows cools the rectifying device 5 and is then conducted to an intake port 101 formed in a partition plate 10. At this time, as in the first embodiment, the cooling air from the radial intake window 802b flows via the plural sub fins 505, while the cooling air from the radial intake window 802a flows via a passage sandwiched in between a large-diameter fin 503a and the partition plate 10, so that the cooling performance for the large-diameter fin 503a can be improved. Although in Fig. 8 the positive diode 502 is disposed on the large-diameter fin 503a and the negative diode 504 is disposed on a small-diameter fin 501a, the fin-diode combination may be reversed. Further, the radial intake windows 802a and 802b positioned close to each other may be combined into a radial intake window.

[0027]

Although the rectifying device described in the first embodiment includes two sets of three-phase full-wave rectifier circuits, it goes without saying that the construction of the present invention is applicable also to a rectifying device including an ordinary one set of a rectifier circuit or three or more sets of rectifier circuits and that also in this case there can be obtained the same effect as above.

[0028]

Although in the first embodiment the diodes are driven into the cooling fins, there may be adopted an electrical connection structure using soldering for example.

[0029]

Although the protective cover described in the first embodiment is made of resin, there may be adopted a metallic cover, allowing the cover itself to serve as a heat dissipating fin to promote the transfer of heat from the rectifying device.

[Brief Description of the Drawings]

Fig. 1 is a partially cut-away axial sectional view of an AC generator for a vehicle according to a first embodiment of the present invention;

Fig. 2 is a plan view as seen from a rear side of the AC generator for a vehicle of Fig. 1 with a protective cover removed;

Fig. 3 is an enlarged partial sectional view of a principal portion of the AC generator for a vehicle of Fig. 1;

Fig. 4 is a partial perspective view of the AC generator

for a vehicle of Fig. 1;

Fig. 5 is an entire perspective view of the protective cover in the AC generator for a vehicle of Fig. 1;

Fig. 6 is a partial enlarged view of apertures in the protective cover as seen in the radial direction of the AC generator for a vehicle of Fig. 1;

Fig. 7 is a partial perspective view of a rear frame in an AC generator for a vehicle according to an other embodiment of the present invention;

Fig. 8 is an enlarged partial sectional view of a principal portion of the AC generator for a vehicle according to an other embodiment;

[Explanation of Reference Numerals]

1 pulley

2 rotor

3a, 3b frame

4 stator

5 rectifying device

501 positive fin

502 positive diode

503 negative fin

504 negative diode

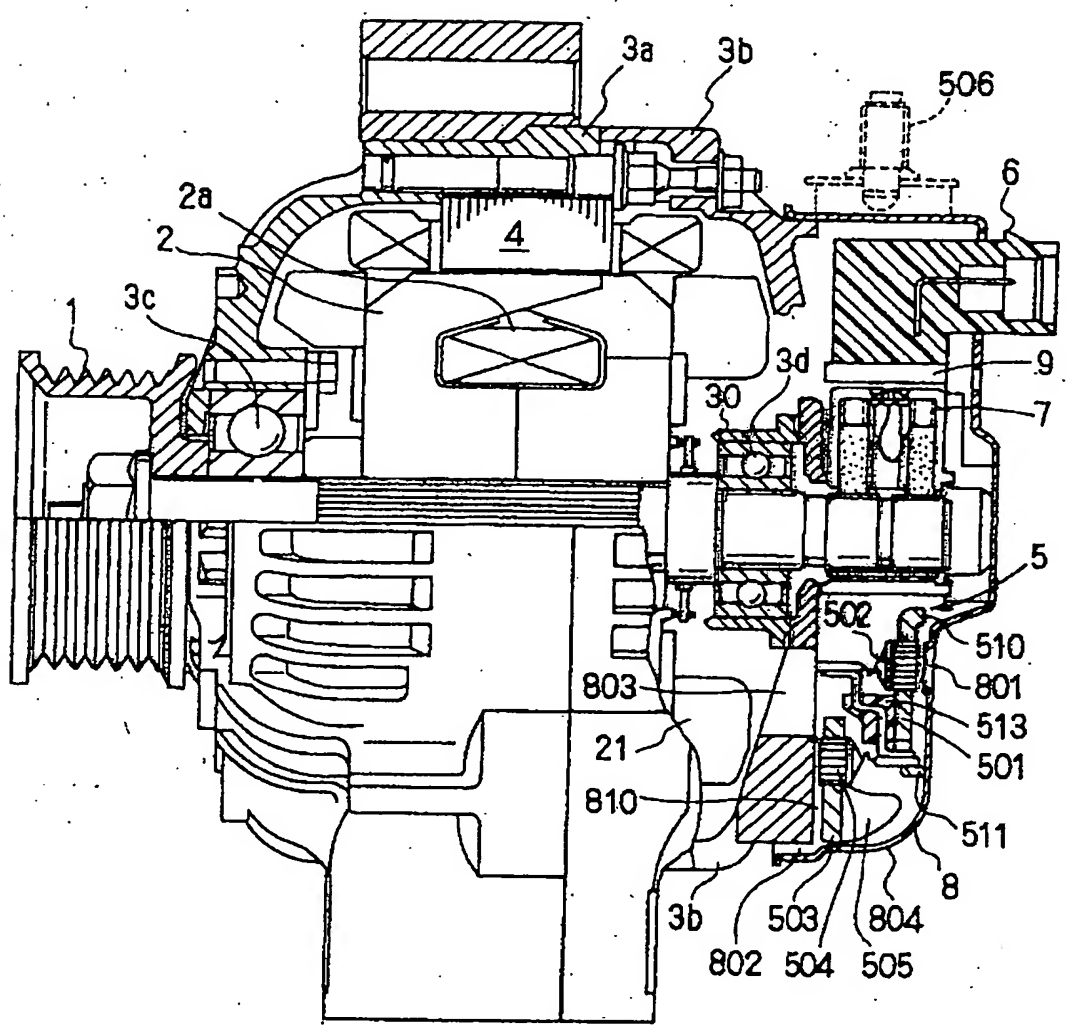
505 sub fin

507 second sub fin

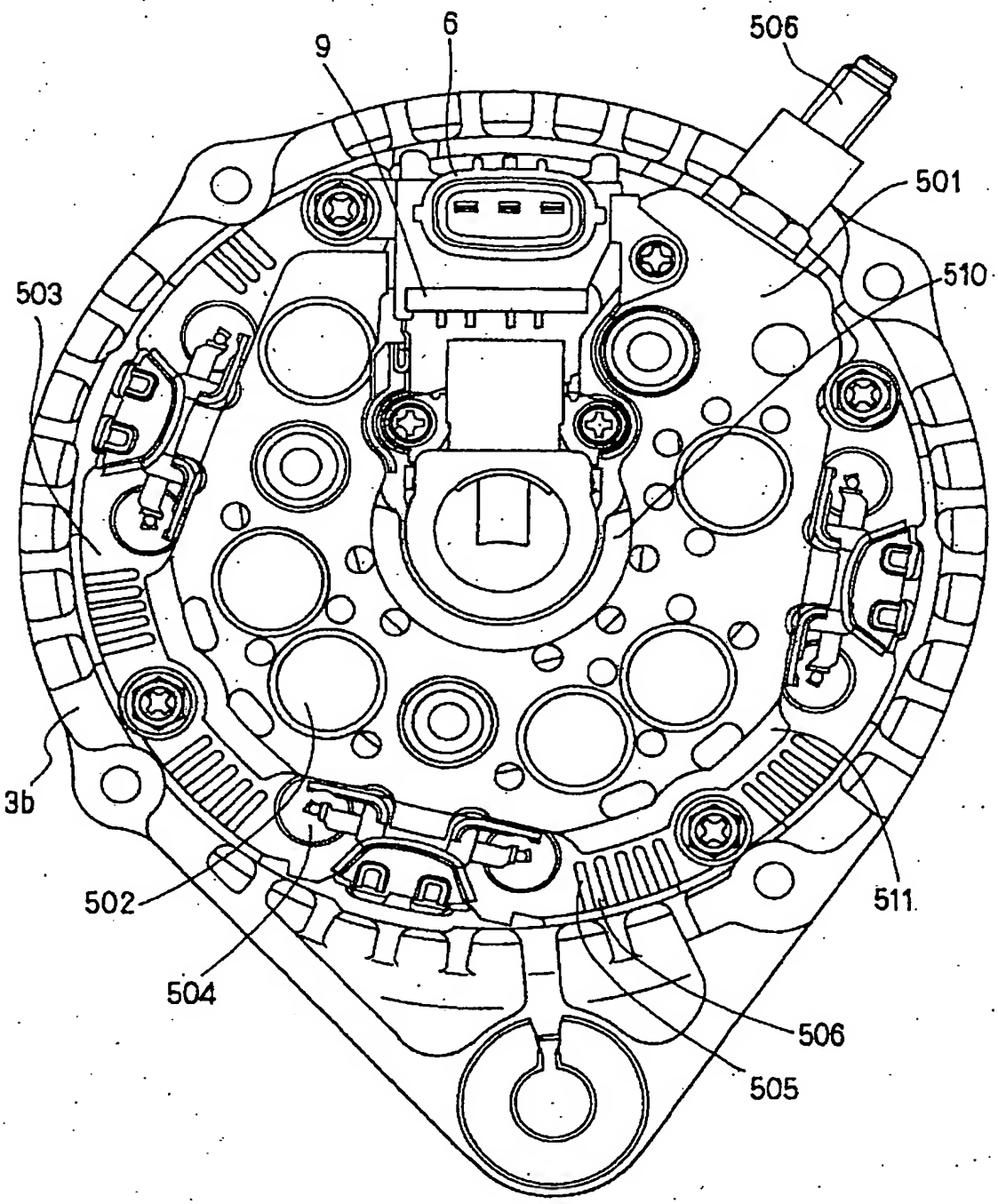
8 protective cover

【書類名】　図面
NAME OF ARTICLE　DRAWINGS

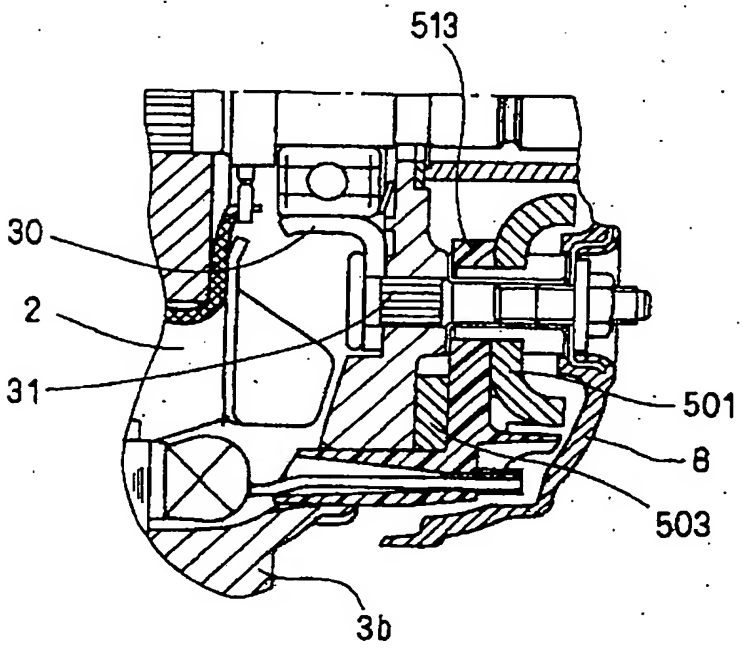
【図１】
FIG.1



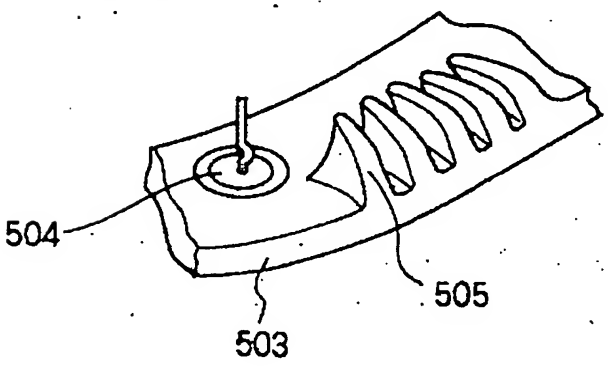
【図２】
FIG.2



【図３】
FIG.3

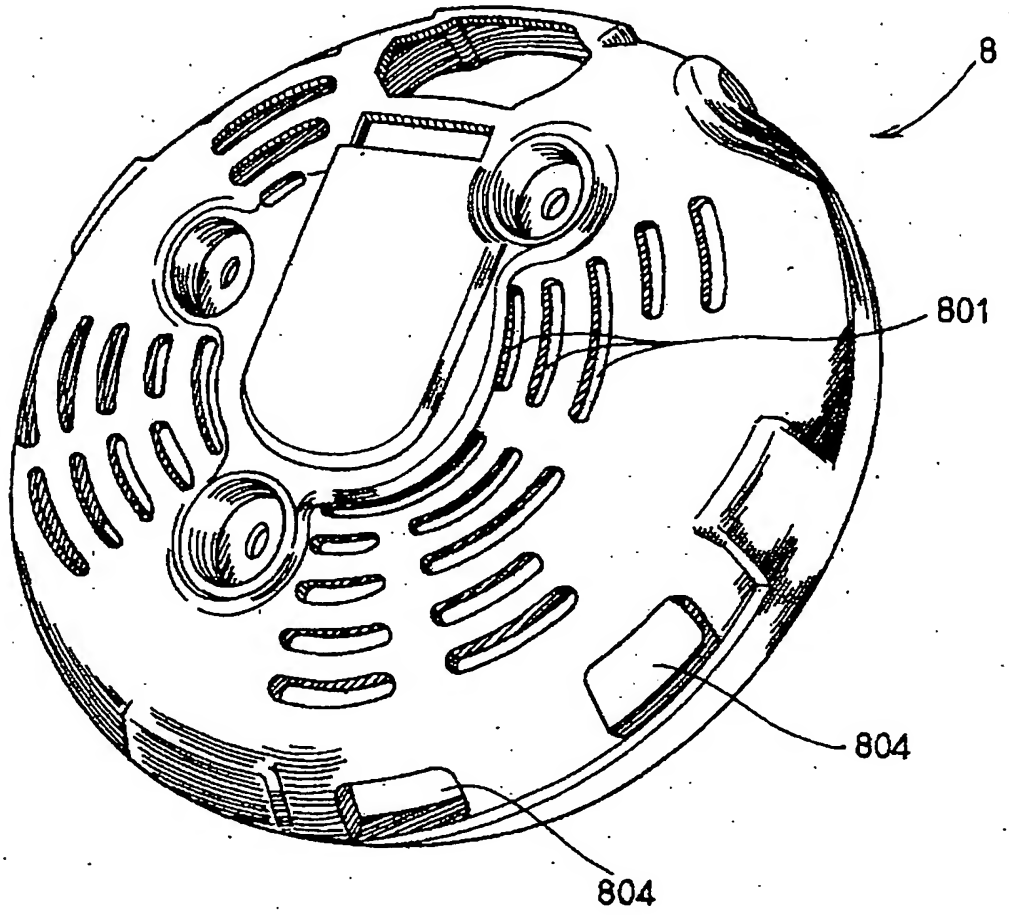


【図４】
FIG.4



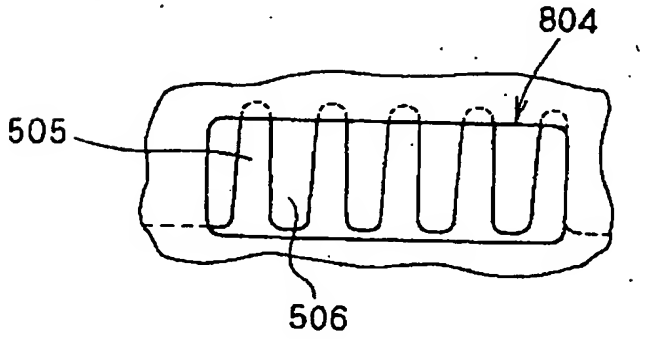
【図５】

FIG.5

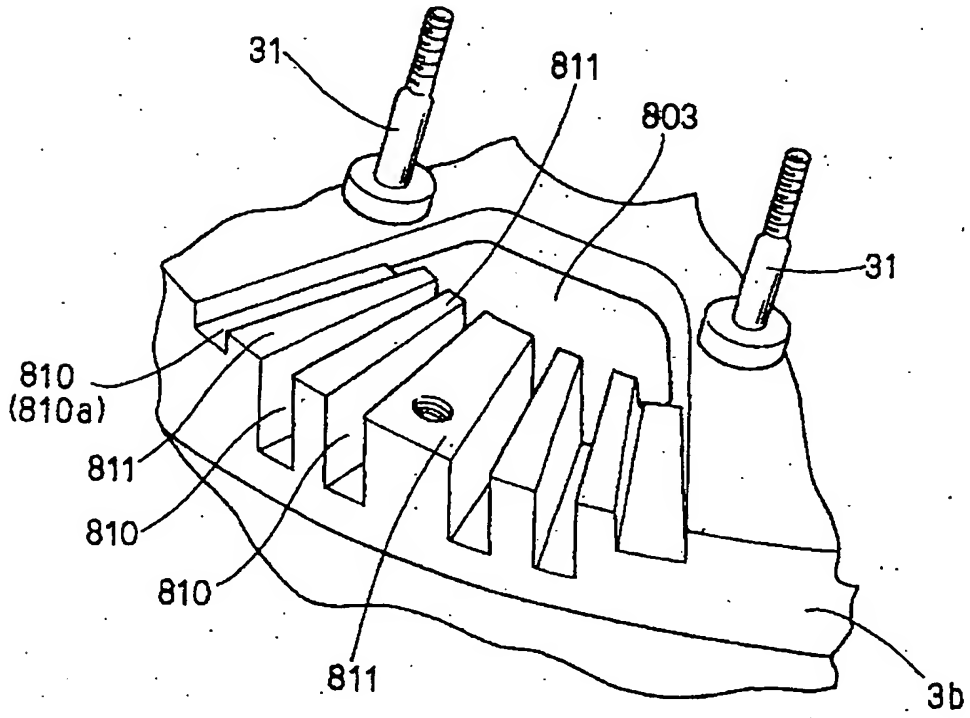


【図６】

FIG.6

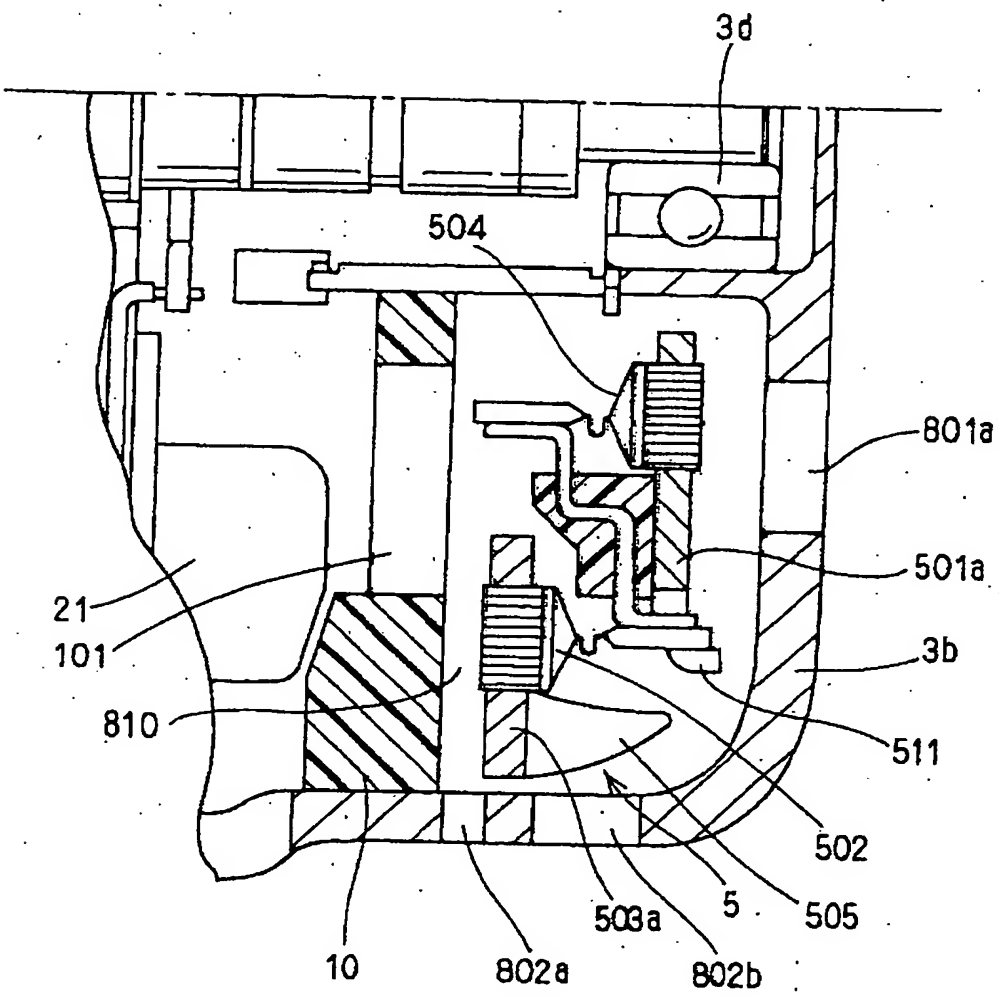


【図７】
FIG.7



【図８】

FIG.8



[Name of Document] Abstract

[Abstract]

[Problem]

It is intended to provide an AC generator for a vehicle having a rectifying device capable of attaining both improvement of a cooling performance matching the reduction of size and a higher output and improvement of the resistance to environmental conditions.

[Solution]

Near the outer periphery of a negative fin 503 are provided several portions in each of which a plurality of sub fins 505 extending in a radial fashion axially on an opposite-to-frame side are formed in proximity to one another. A radial air flow path 506 is formed between adjacent sub fins 505. Radial apertures 804 are formed in a protective cover 8 on a radial outer side corresponding to the plural sub fins 505.

[Selected Drawing]

Fig. 1